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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/807,158	05/15/2001	Hermann Diehl	U013268-7	3157

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EXAMINER

LUU, THANH X

ART UNIT

PAPER NUMBER

2878

DATE MAILED: 09/12/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/807,158

Applicant(s)

DIEHL ET AL.

Examiner

Thanh X Luu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 May 2001 and 14 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-35 is/are pending in the application.
- 4a) Of the above claim(s) 25-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18-24 and 31-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 May 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8. 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to preliminary amendments filed May 15, 2001 and August 7, 2001. Claims 18-35 are currently pending.

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: page 6 of the specification mentions "window 8", which could not be found in Figure 1, further, Figure 2 shows "8" as a beamsplitter. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. This application does not contain an abstract of the disclosure as required by 37 CFR 1.72(b). An abstract on a separate sheet is required.

Claim Objections

3. Claim 31 is objected to because of the following informalities:

In claim 31, lines 2 and 9, "a space vehicle" is mentioned twice. It is unclear how many space vehicles are claimed? It appears that Applicant intended to refer to the same space vehicle. If so, Examiner recommends using --the space vehicle-- on line 9.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

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Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 25-30 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Applicant claims a product in claim 24 and a process in claims 25-30 resulting in a product and a process in the same claim (claims 25-30 based on the dependency from claim 24). Since the scope of the claims is unclear, claims 25-30 are withdrawn from consideration and not examined on its merits.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 33 and 34 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Regarding claim 33, Applicant does not sufficiently describe in the specification what model-based tracking of the rim consists of. That is, it is unclear how "model-based tracking of the rim of the earth" is carried out.

Regarding claim 34, Applicant has failed to sufficiently describe an embodiment in which a long-wave fraction of radiation is filtered in determining the rim of the earth.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 18-30 and 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 18, it is unclear what a "means for variable control of exposure time" consists of. That is, no structure or circuit is mentioned in the specification that corresponds to the means plus function element. Furthermore, since no brightness level is described as being measured, it is unclear how the variable control of the exposure time depends on the brightness.

Regarding claim 20, it is unclear in its given context how a common optical arrangement (of claim 19) becomes an optical arrangement for star observation and an optical arrangement for earth observation. That is, the limitations of a common optical arrangement and two different optical arrangements are conflicting. Further, "the optical arrangements" lacks proper antecedent basis, since it is unclear if the term refers to the common optical arrangement or not. In the rejection set forth below, Examiner has assumed that claim 20 is dependent from claim 18 since it appears that Applicant intended to claim two separate embodiments having different optical arrangements as evidenced by Figures 1 and 2.

Regarding claims 25-30, Applicant claims "[t]he method according to claim 24. Claim 24 is drawn to an apparatus. Thus, it is unclear which method Applicant is referring to.

Regarding claim 34, "the radiation used for determining" lacks proper antecedent basis.

Claims 19-24 are indefinite by virtue of their dependency on an indefinite claim.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 18-24, as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Falbel (U.S. Patent 5,189,295) in view of Frame et al. (U.S. Patent 6,252,627).

Regarding claims 18, 20-22 and 24, Falbel discloses (see Figure 3) a combined earth-star sensor system for three-axis attitude determination of a satellite in space, the system comprising: separate apertures (at 16 and 36) with different directions of observation of earth (to earth) and stars (to polaris) and common image pickup devices (pixels in 10) for the earth observation and the star observation. Falbel further discloses (see Figure 3) an optical arrangement (38) for earth observation and an optical arrangement (40) for star observation and a semitranslucent beam splitter (36) between the apertures and the optical arrangements for deviating laterally entering light from the earth and transmitting light from the star, to the image pickup devices. Falbel also discloses (see Figure 3) the light from the star travels longitudinally to the optical arrangement (40) for star observation. Falbel further discloses (see Figure 3) the aperture for light from the earth (16) is considerably smaller than the aperture for light from the star (40). Falbel does not specifically disclose a means for variable control of

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exposure time of earth and star observations based on a brightness being observed.

Frame et al. teach (see column 4, lines 14-23 and column 15, lines 30-35) a star sensor having a means (see Figures) for varying the exposure time based on the brightness being observed. Frame et al. recognize that improved detection through better signal-to-noise ratios can be achieved by longer exposure times for stars. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a means for varying the exposure time as claimed in the apparatus of Falbel in view of Frame et al. to increase signal-to-noise ratios of the star observation signals and improve detection.

Regarding claims 19 and 23, Falbel in view of Frame et al. disclose the claimed invention as set forth above. Falbel also discloses (see Figure 1) a common optical arrangement (14) for earth and star observation and a deflection mirror (18). Falbel further discloses (see Figure 1) the aperture for light from the earth (16) is considerably smaller than the aperture for light from the star (at 34 degrees). Falbel does not specifically the deflection mirror reflecting of laterally entering light from the earth to the common optical arrangement. However, the choice between which light is reflected and which light is transmitted would require only routine skill in the art. Further, Falbel teaches (see Figure 3) having light from the earth laterally reflected. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the light from the earth laterally reflect off the deflection mirror of Falbel in view of Frame et al. to further reduce the higher intensity light from the earth and improve star detection.

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12. Claims 31-35, as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Falbel in view of Billing-Ross et al. (U.S. Patent 5,319,969) and Frame et al.

Regarding claims 31 and 32, Falbel discloses (see Figures 1-3) a method of simultaneous orbit determination and attitude determination of a space vehicle, comprising: simultaneously forming images of a star (polaris) and the rim of the earth (see column 2, line 56, "crescent") in one focal plane (at 10) of a sensor system; determining attitude of the star in the focal plane (see column 3, lines 15-25); determining the rim of the earth by image processing (see column 4, lines 33-39); and calculating at least one of orbit or attitude of the space vehicle (see Figure 4, pitch, roll, yaw). Falbel also discloses (see column 3, line 17) an evaluation system of the sensor system operates by including a star catalog (ephemeris data), disregarding areas in the image of the rim of the earth of star images superimposed on the earth image (column 4, lines 33-39) as claimed. Falbel does not specifically disclose determining rates of rotation. Billing-Ross et al. teach (see column 4, lines 40-48) using movement of stars to determine rates of rotation. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to determine rates of rotation through observing the movement of the star in the method of Falbel in view of Billing-Ross et al. to provide additional data on the space vehicle to more accurately track it. Falbel also does not specifically disclose adapting exposure time based on the difference in brightness. Frame et al. teach (see column 4, lines 14-23 and column 15, lines 30-35) a star sensor having a means (see Figures) for varying the exposure time based on the

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brightness being observed. Frame et al. further recognize that improved detection through better signal-to-noise ratios can be achieved by longer exposure times for stars. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to alternate the exposure time as claimed in the method of Falbel in view of Billing-Ross et al. and Frame et al. to increase signal-to-noise ratios of the star observation signals and improve detection.

Regarding claims 33 and 35, Falbel in view of Billing-Ross et al. and Frame et al. disclose the invention as set forth above. Falbel does not specifically disclose tracking the rim of the earth using models or determining the rim based on earth models. Billing-Ross et al. teach (see column 6, lines 1-15) determining satellite orientation based on comparing limb (earth) images with limb models. Since the orientation of the satellite is determined by using earth models, the orientation of the rim of the earth is subsequently tracked as well. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to track the rim of the earth using models in the method of Falbel in view of Billing-Ross et al. and Frame et al. to more accurately obtain positional information of the space vehicle. Further, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use earth models to determine the rim of the earth in the method of Falbel in view of Billing-Ross et al. and Frame et al. to further verify the detection of the rim and improve the accuracy of detection.

Regarding claim 34, Falbel in view of Billing-Ross et al. and Frame et al. disclose the invention as set forth above. Falbel does not specifically disclose filtering long wave

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radiation. Frame et al. teach (see column 3, lines 50-60) that stellar background noise interferes with detection. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to filter out long wave fraction of radiation used for determining the rim of the earth in the method of Falbel in view of Billing-Ross et al. and Frame et al. to reduce noise and improve rim detection.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh X. Luu whose telephone number is (703) 305-0539. The examiner can normally be reached on Monday-Friday from 6:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font, can be reached on (703) 308-4881. The fax phone number for the organization where the application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

txl
September 6, 2002

Thanh X. Luu
Patent Examiner